

# CHEM 233 Final Examination Information, Summer 2009

## Part I: Schedule

The CHEM 233 final exam is on Thursday, August 6, 2009 in room 250 SES from 6:00 – 8:00 PM.

## Part II: Exam Conflicts and Makeup Exams

1. Make-up exams will only be given for students showing proof of enrollment (e.g. a printed UIC schedule) in a course listed *before* CHEM in the schedule of classes *with an exam conflict* (example: BIO 101, but NOT PHYS 101). Schedule of classes URL: [www.uic.edu/depts/ims/classsschedule/](http://www.uic.edu/depts/ims/classsschedule/).
2. Students meeting the above criteria must notify Dr. Landrie *by email* (clandri@uic.edu) no later than Tuesday, August 4 at 4:00 pm to be put on the makeup exam list. The makeup exam will be on Thursday, August 4 at 10:00 am in my office, 2206A SEL. Students must show a class schedule on that day that indicates their enrollment in a course listed *before* CHEM in the schedule of classes *and that has an exam conflict*.

## Part III: Policies

1. Exams start and end promptly. Students should arrive 10 minutes early to find their seats. No additional time will be granted for late students.
2. Each student must present a valid UIC or State photo ID to obtain an exam. Pictures on the ID should be clearly visible and not excessively worn or degraded. No exceptions. No valid ID, no exam.
3. A seating chart will be distributed the day of the exam. Exams will be pre-labeled with each student's name and distributed according to the seating chart. Students not in the correct seat will not receive an exam.
4. These electronic devices may **NOT** be used during the exam: cell phones, PDA's, iPod's, laptops, and earphones.
5. Upon completion, your exam must be turned in to your TA personally. Once collected your TA will sign the exam. Exams without your TA's signature or exams found on desktops, tables and the general vicinity will not be accepted or graded.

## Part IV: Exam Format

The final exam will consist of 50 multiple choice questions, each worth 2 points, covering both the chemical theory and laboratory techniques presented in the course.

## Part V: Sample Questions

A mixture containing 1-phenyl ethanol, benzoic acid and *tert*-butyl benzene were separated by normal phase chromatography. Using neutral alumina as the stationary phase and petroleum ether as the eluant, predict the order in which these compounds will elute from the column.

- a. benzoic acid, *tert*-butyl benzene, 1-phenyl ethanol
- b. 1-phenyl ethanol, benzoic acid, *tert*-butyl benzene
- c. *tert*-butyl benzene, 1-phenyl ethanol, benzoic acid
- d. none of the above

In the lab "Preparation of Tertiary Alkyl Chlorides," what is the purpose of washing the organic layer with saturated sodium bicarbonate?

- a. remove the remaining CO<sub>2</sub> gas present in the solution
- b. neutralize the remaining hydrochloric acid in the solution
- c. neutralize the remaining acetic acid in the solution
- d. none of the above

How much water must be added to 10 mL of concentrated (18 M) sulfuric acid to dilute it to a 3 M solution?

- a. 6 mL
- b. 0.6 mL
- c. 60 mL
- d. 50 mL
- e. none of the above

Chlorophyll *a* can be converted to \_\_\_\_\_ by protonation with a strong acid such as HCl.

- a. chlorophyll *b*
- b. chlorophyll *c*
- c. xanthophylls
- d. carotene
- e. none of the above

2-methyl propan-1-ol reacts with \_\_\_\_\_ in a(an) \_\_\_\_\_ mechanism to yield \_\_\_\_\_.

- a. HCl, S<sub>N</sub>2, 1-chloro-1-methylpropane
- b. HCl, S<sub>N</sub>1, 1-chloro-2-methylpropane
- c. H<sub>2</sub>SO<sub>4</sub>, E1, 2-methylpropene
- d. none of the above

Which of the following rate laws accurately represents the rate determining step in a unimolecular nucleophilic substitution reaction of an alcohol with HCl to yield an alkyl chloride?

- a. rate= $k$ [carbocation]
- b. rate= $k$ [alcohol][HCl]
- c. rate= $k$ [oxonium ion]
- d. none of the above

In simple distillation a \_\_\_\_\_ is attached to the stillpot then a West condenser, whereas in fractional distillation a \_\_\_\_\_ is inserted between to increase \_\_\_\_\_.

- a. thermometer adapter, hempel column, the number of theoretical plates.
- b. Claissen adapter, hempel column, the number of theoretical plates.
- c. dropping funnel, claissen adapter, the efficiency of separation.
- d. None of the above.

## Part VI: Final Exam topics.

The final exam will contain, but may not be limited to the topics listed below. Questions generally require you to apply the information rather than recite it.

- Radicals, carbocations: definition, stabilizing factors
- glassware function and names
- steam distillation: requirements, additive partial pressures
- retention factor calculation
- solvent miscibilities
- percent yield calculations
- Hooke's law/frequency conversions
- HETP calculations
- percent composition diagram
- gas chromatography: column construction and types
- melting point depression
- dilution calculations (i.e.  $M_1V_1 = M_2V_2$ )
- solubility of organic substances in aqueous base, aqueous acid, or organic solvent
- rate laws of SN1, SN2, mechanisms
- relative eluting power of solvents
- silver nitrate test, NaI test
- simple/fractional distillation
- carvone: structure, properties and stereoisomers
- thin layer chromatography (Rf calculation)/spinach pigments
- common functional group names and relative polarities
- basic infrared spectroscopy theory (i.e. IR active = dipole moment)
- requirements for successful recrystallization
- oxidation/reduction and determining oxidation numbers for neutral carbon
- semicarbazone derivitization
- mechanism of alkyne hydration
- purpose of procedural steps undertaken during diazo coupling and hydrogenation
- determining cis vs. trans alkenes using J-values
- precautions taken while handling CuI
- Biodiesel: definition, importance, emissions and surrogates
- Thin-layer chromatography analysis of diazocoupling and hydrogenation
- Percent yield calculations
- Match IRs to correct structural formula
- General knowledge of the names and structures of the chemicals encountered in the course
- Determine empirical formula, molecular formula and IHD
- Thermal conductivity detector and correction factors
- Increase MW = increased VWF = lower v.p. (higher b.p.) = lower conc. in GC stationary phase = shorter r.t.
- Factors affecting retention time in GC
- Role of NaBH<sub>4</sub> in Ni-catalyzed hydrogenation
- Equivalents
- No material from the practical exam will be on the final exam.

## Part VII: Laboratory Notebooks

Laboratory notebooks are due ON the day of the lab practical exam. Late notebooks will not be accepted. Since you will not be allowed to use your laboratory notebook during the practical exam, you will need to take your practical exam notes on loose-leaf paper.

## Part VIII: Practical Exam Reminders

- All necessary information for the practical exam can be found at the end of the course manual. Read ALL of this material CAREFULLY so that you are adequately prepared.
- No printed material—including the textbook, handouts or anything photocopied—may be used during the exam. You may only use your own handwritten notes.
- Take notes on loose-leaf paper. These will be turned in at the end of the exam and used to evaluate your performance.
- On the day of the practical, each student will receive a predetermined mass of starting material, 3-nitrophthalic acid, that is not the 1.0 grams with which the textbook begins. You will need to calculate the quantities of all other reagents needed in your synthesis based on the starting mass you've been given and the equivalents in the reaction table.
- You must be thoroughly prepared in order to finish the exam within the time allowed. The exam ends promptly at the class end. Failure to finish will significantly lower your exam score.
- The prelab quiz will be given during the first 10 minutes of class. Please arrive early. Additional time will not be granted for late students. You may use your handwritten notes on the prelab quiz.